Bravo Tech Inc
Beyond Technology Innovations

BMB Multi -Carrier Power Amplifier Installation And Debugging

Bravo Tech (Shen Zhen) Co.,Ltd

A leading provider for smart coverage enhancement solution in the worldwide wireless communication industry

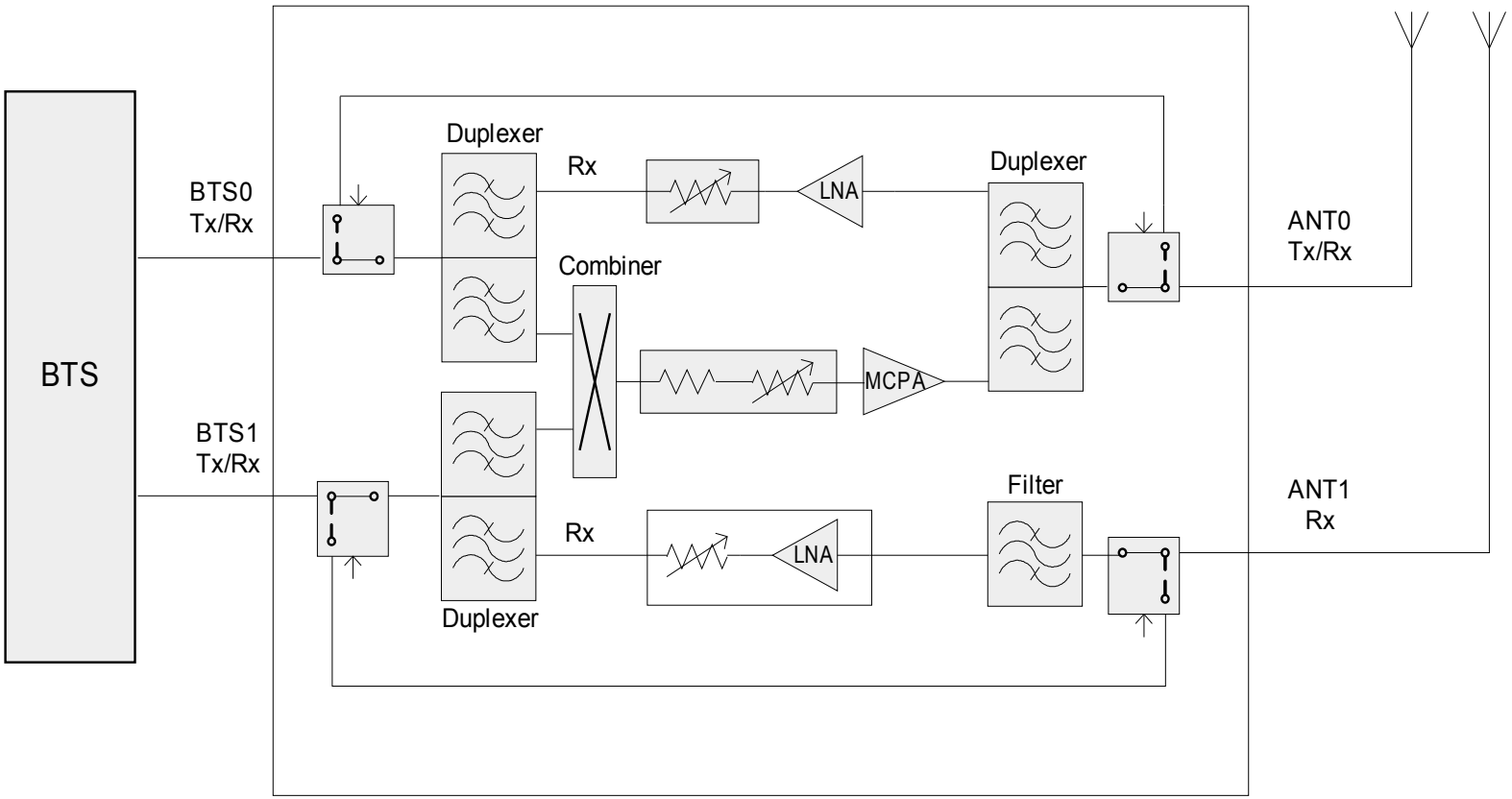
Catalogue

- Explain of function
- The skills of installation and debugging
- Classical case of fault location
- Questions & Discussion

Functions

- Amplify the downlink signal, could enhance the output power of BTS to 150W, extent coverage range of BTS.
- Amplify uplink signal, reduce the noise figure of BTS, enhance the receiver sensitive.
- Provider automatic bypass protection.
- Input attenuator inside, so there is no need to adjust the output power of BTS. The operation of BTS reset, frequency adjustment won't make system fault or halt.
- Local & remote monitoring, user can select local and remote monitoring according to their requirement .
- Support diversity reception and amplifier.

System Block Diagram



Main Function Module

Multi carrier amplifier adopt module design, so it is convenience and efficient to installation and maintenance :

- BMB multi carrier power amplifier (high linear power amplifier adopt the technique of pre-distortion and feed-forward)
- LNA lower noise amplifier (high sensitive, lower noise, gain linear adjustment)
- Duplex combiner unite (high separation and high power duplex, automatic attenuator combiner)
- RF relay (equipment fault, realize the power cut and automatic bypass)
- Supply power unite
- Central control unite (local and remote monitoring and maintenance control)

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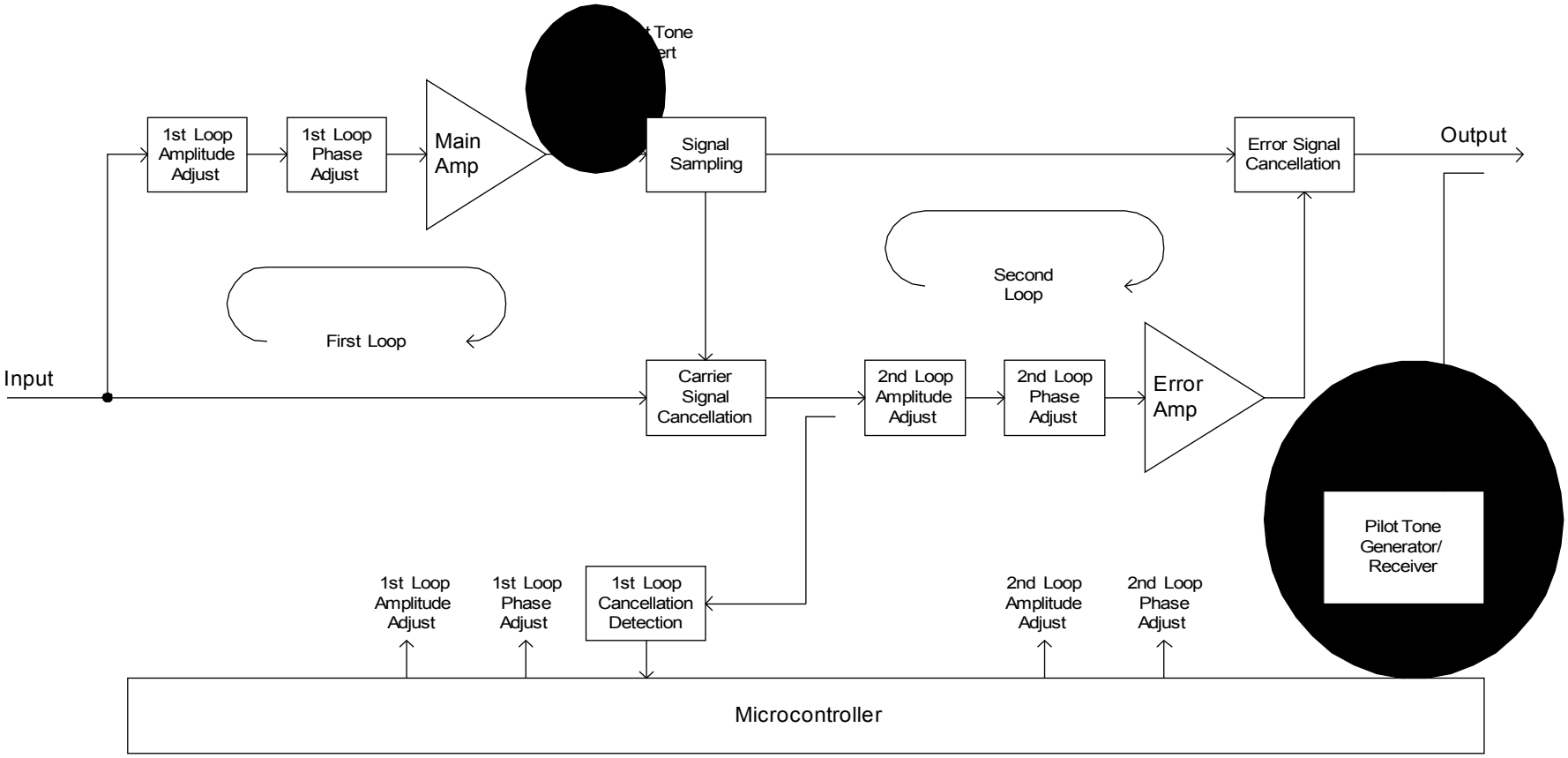
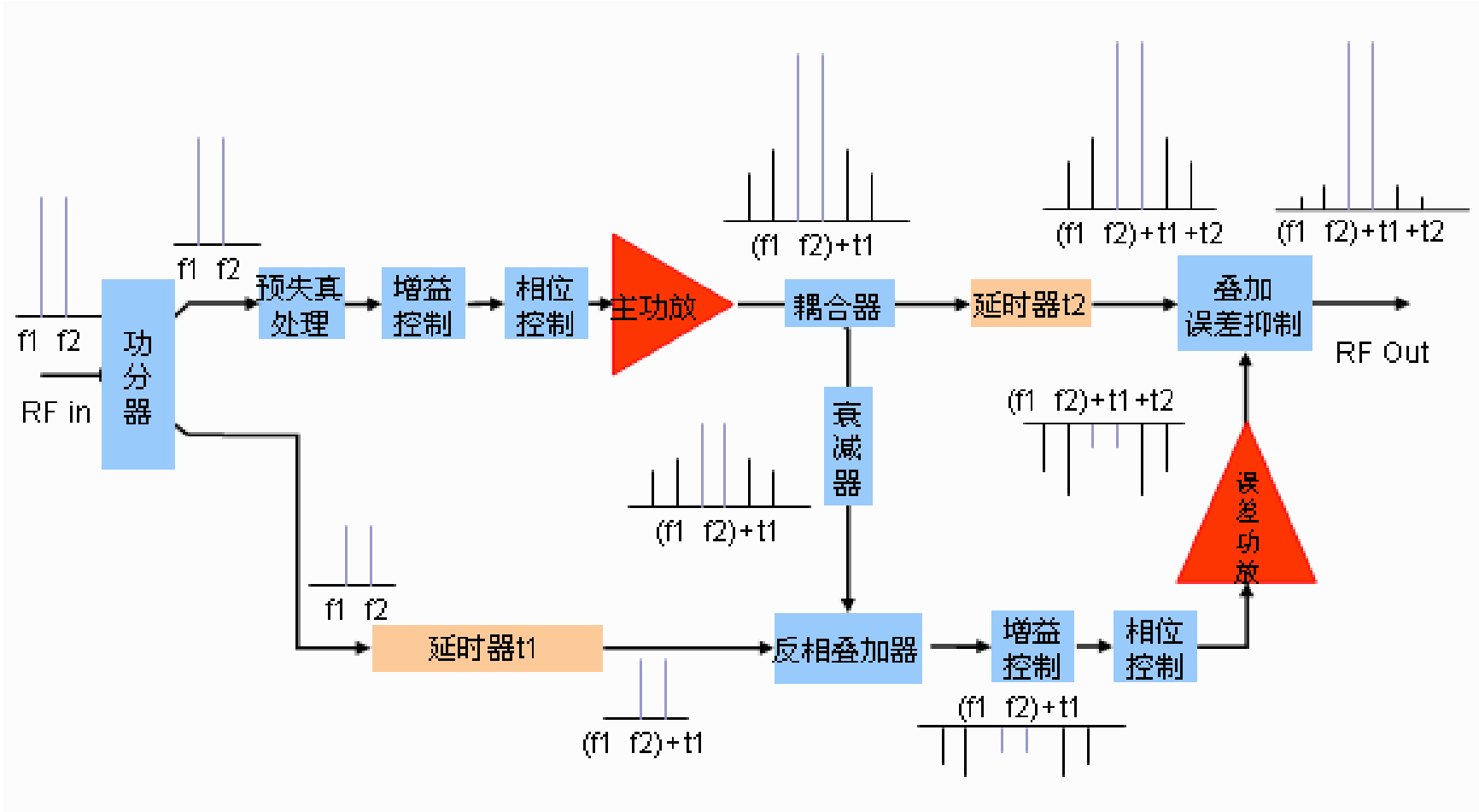
MCPA Principle of signal processing

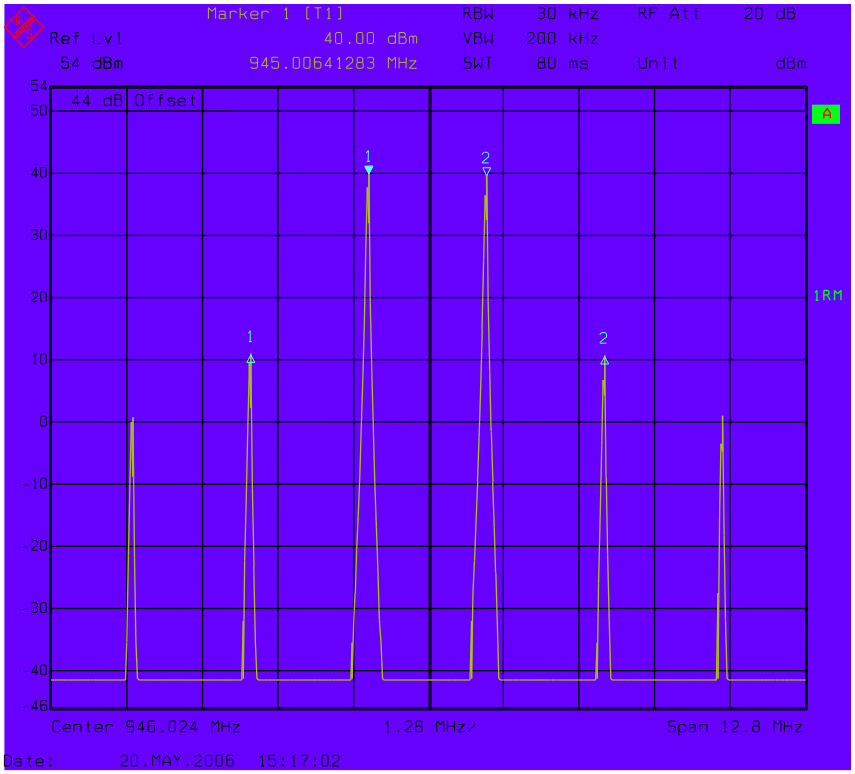


•MCPA Principle of signal processing

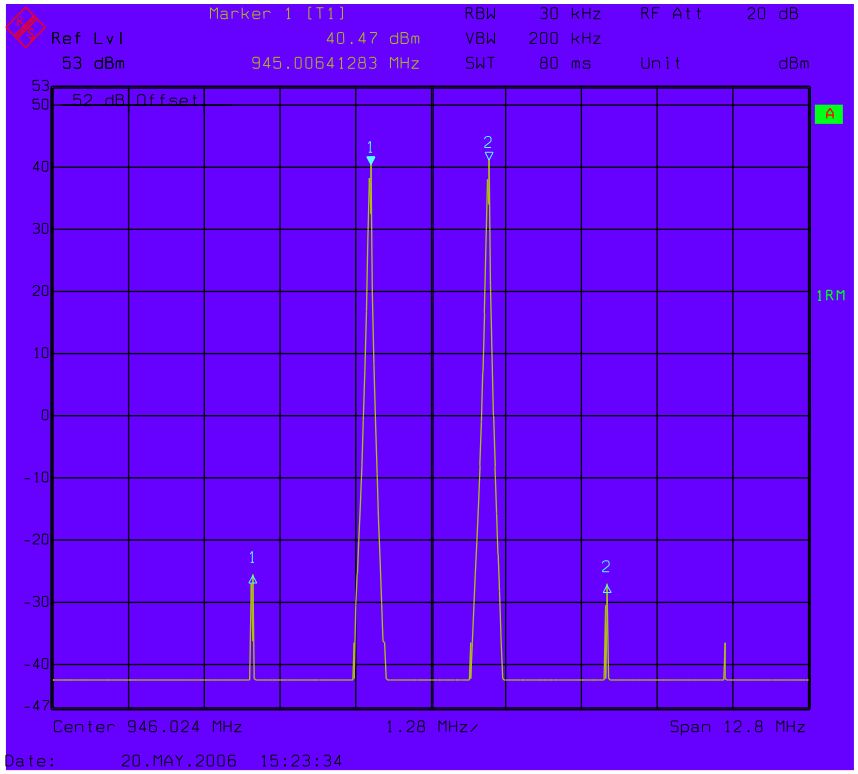


Technique advantage of MCPA and SCPA

If there are two carriers and output power is 150W. The inter-modulation (IMD) of SCPA and MCPA as following:



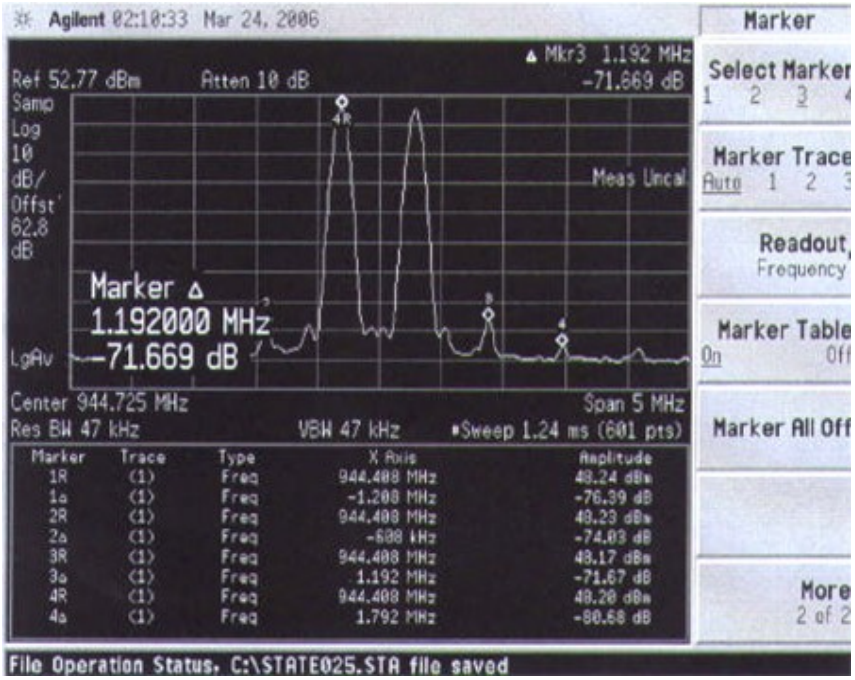
SCPA IMD ≤ 30dBc

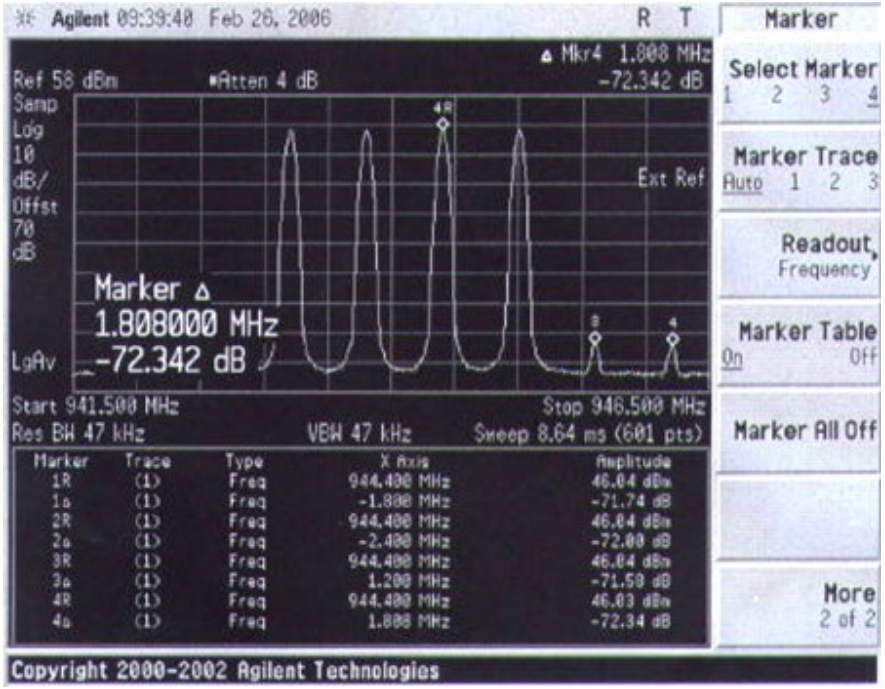


MCPA IMD ≥ 70dBc

MCPA Testing Report

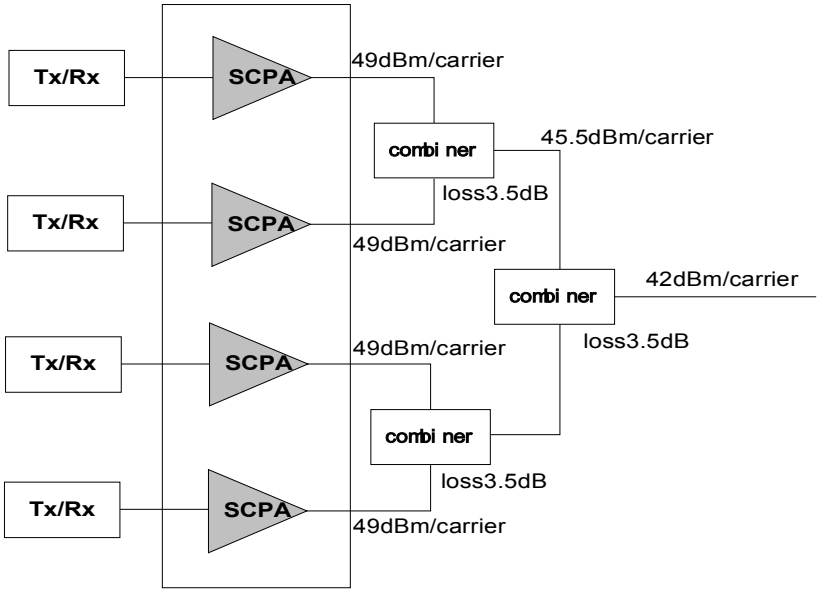
If there are two or four carriers in f2~f4 and output power is 150W then the MCPA IMD≥70dBc



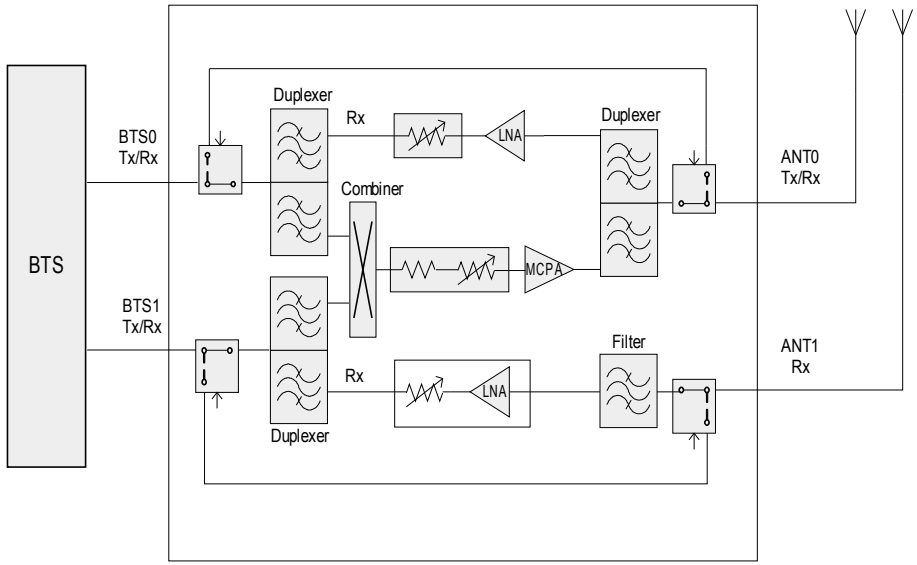


MCPA vs SCPA

- Ability of Multi-carrier amplifier and processing: MCPA can amplifier all carriers of one sector at the same time.
- Flexible configuration: when BTS add channel, it needn't to add MCPA module, so can save cost for BTS update.
- Small enclosure: save space of BTS installation, simple and quick installation.

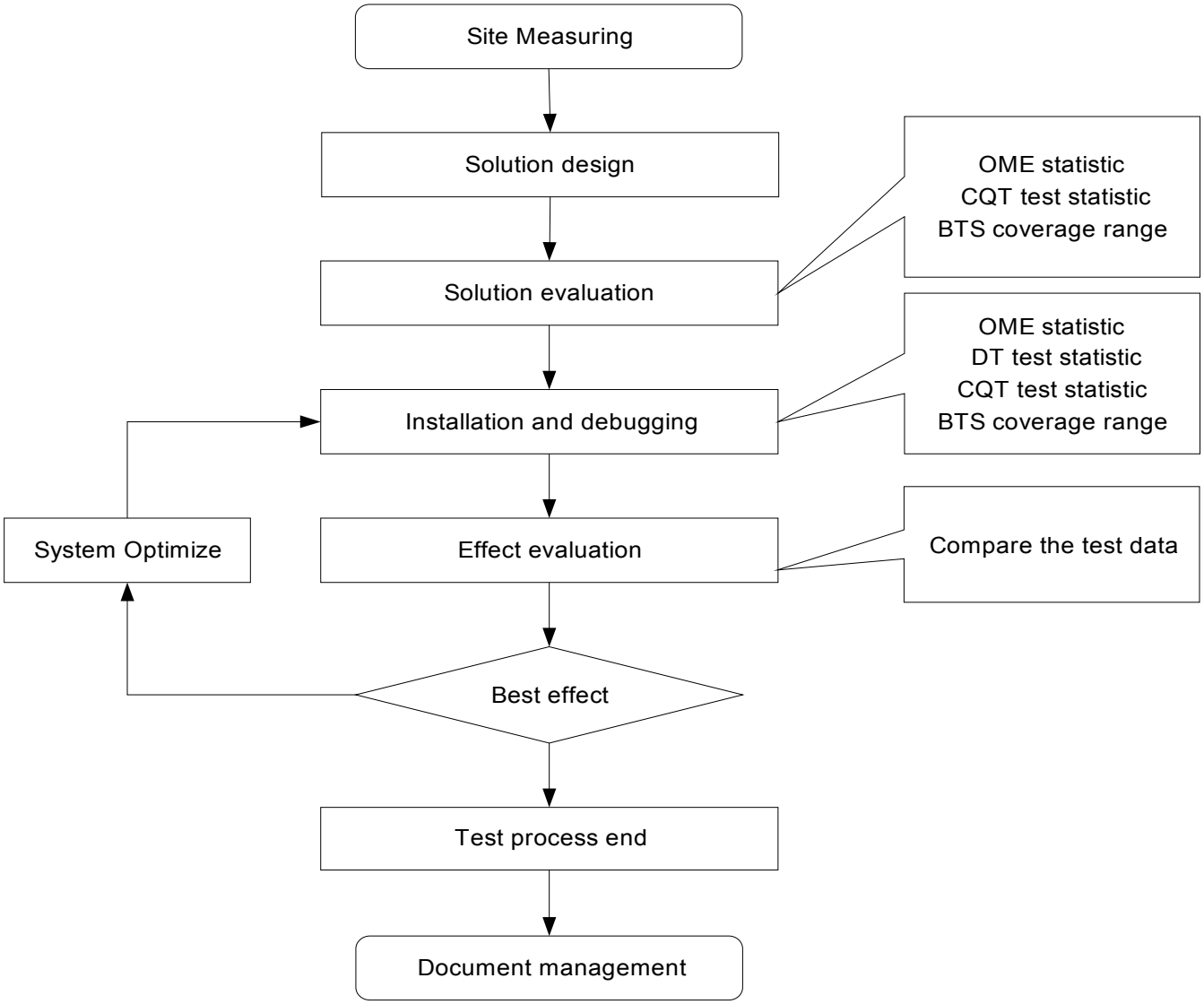


SCPA



MCPA

Installation Process



Installation --- Step 1

- Record BTS information: number of carriers, power of carrier, type of combiner, length of feeder, situation of power supply and feeder distribution.
- Feasibility analysis: Gdown=Pout-Pin=Pout-(PBTS-Loss)
- Analyses the geography environment and wireless environment of optimize area（ Choose reasonable site to get the best optimize effect ）
- DT 、 CQT Test（ convenience for effect evaluation after equipment operated ）
- OMC Traffic statistic analysis（ Mainly for capacity of traffic analysis ）
- Solution design and evaluation.

Installation --- Step 2

- **The installation location's choosing and fixation**

  The MCPA can be mounted on the outside floor or wall. The amplifier should be fixed near to the antenna as far as possible and the followings are the installation requirements :

  Firstly, the location for installation should be non corrosive and non high tension electricity leakage.

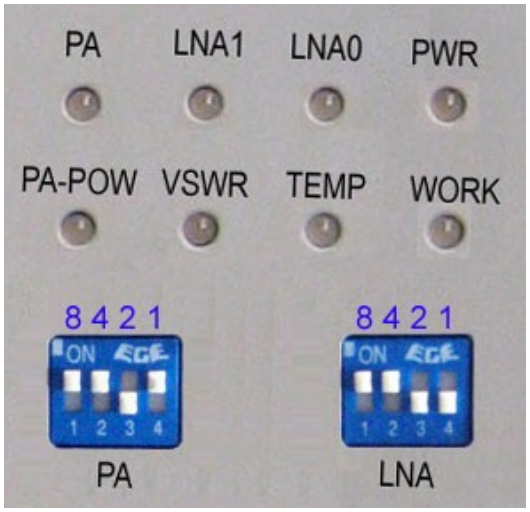
  Secondly, if the amplifier should be mounted on the wall, the wall bearing should be no less than 55 kg, and the wall should be built by concrete or bricks so that the plug bolts can be fixed. The stone wall or mud wall can't be considered.

Installation --- Step 3

- **Wiring manner and Power source choosing**

1. The power cable should be connected firmly, the power connector can not be loosed and broken, and be careful about the connector ground terminal.
2. The power cable must be connect with air-break switch (10A).
3. All the wire covering of the cables shouldn't be damaged and the ground wire should be better contact.
4. All the cables should be placed properly, and the turning should be relaxed. The through cable should be straight, smooth and without cross. The cables in the same directions should be bound to branches and the branches also should be tidy and unified.

Installation --- Step 4: Project measuring and testing



- **The gain setting of PA :** Before testing the PA, first put the switch of PA gain on the ‘ ON’ side, that means the PA gain is ‘0’. Then adjust the gain step-by-step according to the estimated value. While adjusting, leave ‘1’ margin in order to prevent overpower and device damage.
- **The gain setting of LNA :** For engineering experience, the gain setting of LNA = 8~12dB is recommended.
- **The test of VSWR and Power :** The VSWR and power can be read from a handheld monitor or a computer. The VSWR can be tested by the spectrum analyzer at the BTS ANT terminal also.

Installation --- Step 4 : Project measuring and testing

- **The test of MODEL :** Insert a SIM into the MODEL (pay attention to the direction), read the working state of the device from a test cell phone and make sure that the phone can control the device.

- **The test of DT 、 CQT :** After testing and setting, when the device is employed, the test of DT and CQT should be conducted in this area. And the test location should coincide with the test location before device installation so as to compare and analyze the data.

- **The OMC speech system and interference analysis :** Measure the speech quantities, connection success rates, cut-off rates, switching over rates and the balance situation of interference link before and after the device installation, then analyze those data in order to estimate the effects of the device.

- **Effects evaluation ：** Make a comprehensive contrastive analysis and record the test report, according to the data above.

Maintenance --- Error positioning

- **Remote positioning ：**

1. Checking the OMC of the base station and alarm information may help to estimate.

2. Checking the speech quantity, connection success and failure rate, switchover success rate, link balancing and interference parameter of the Mobile base station would help us to identify the error of base station or error of the Power amplifier.

3. Comparing the speech parameter between normal period and error period can help us to know which part of the base station was damaged. Therefore, we can prepare a new device advance and improve the maintenance efficiency.

•Maintenance --- Error positioning

On-the-spot Estimation ：

1. Before maintenance, first check the indicating lamp and judge the error according to the state of indicating lamp.
2. Find the error location through reading the state parameters value in a handheld terminal.
3. Decide the error through dialing DT and CQT.
4. Set the device in the state of by-pass, then give a judgment by comparing the by-pass state with the working state.
5. Take apart the device, draw off the Power Amplifier unit, then take a detailed examination.

- **Conclusion** ： According to the methods above, the error of amplifier, LNA, or Power source and so on can be found correctly.

Maintenance --- Ordinary errors

- **No downlink output power ：** Power amplifier without electricity, amplifier's own error, duplexer's error, mixer's error and relay's error may cause this trouble. If there is something wrong with the PA, the load or ring isolator usually was damaged and standing wave alarm often accompanied. Then the trouble unit can be found through testing PA'S temperature. Besides, the errors of duplexer and mixer can cause that the PA has no input signal or the input signal become weak. And the error of RF relay can be examined by the working state of by-pass.
- **Error of Low Noise Amplifier ：** This trouble can be examined through dialing cell phone or the current value of the handheld terminal.
- **Error of the Power Source:** Firstly check the indicator lamp in the panel and fan, then use the multi-meter to examine which current is wrong.

Maintenance --- Ordinary errors

- **Error of Duplexer ：** It is a passive device, and the error chance is less. Once this device broken down, the Mobile base station would warn an alarm.
- **Error of Mixer ：** As our mixer contained an ATT attenuator, so the error may cause the failure of adjusting gain or PA without input signal.
- **Error of controlling panel (including lamp panel) ：** This error may cause the failure of gain adjusting, failure of state information reading, or no power and by-pass error.
- **Error of controlling unit :** If the remote monitoring failed, there must something wrong with Model and controlling panel, or the SIM card isn't fixed well, Model has no power and the port may be blocked.

Maintenance --- Typical Case

- **Warning alarm of the base station lead to the failure of device working :** After the BMB900 was installed in the base station, once the TMB was powered on, the BTS has VSWR alarm and the channel was shut down. Firstly, we thought there must be something wrong with the soft jumping wire. But after exchanging the BST0BST1 port, the main channel still has VSWR alarm. We by-pass the device and found that the bypass working is normally. Then after rechecking, we found that the duplexer is faulty (cold soldering) caused the VSWR alarm.
- **The cut-off rate of speech had been increased after device working :** Since the BMB900 MCPA was installed in the BTS, the drop-call had been increased. After we dial-up test by phone in coverage area, we found that once the signal occupied the TCH28. and signal path, the power level of TCH36 channel was dropped down. Then we went back to the BTS, exchanged the BTS connect cables and found 6 dB discrepancy by handheld terminal test. At last, we sent the TMB back to our company and found a semi-steel cable which connected the duplexer and mixer was damaged.

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Maintenance --- Typical Case

- **The BTS happened to lose coverage :** After a TMB was installed, the signal there became weak and there was nearly no call on BTS. Our engineer used handheld terminal to test and found the forward power of the TMB is quite low, but the VSWR is high. Then we opened the power amplifier and found that the sampling load burned out and the ring isolator also burned out. We changed it with a new power amplifier. The faulty was eliminated.

- **Failure of remote gain change:** After the BTS with TMB installed was expanded, the gain can't be adjusted through remote monitoring center. After an on-the-spot inspection, we found that the manual dial-up switch couldn't work and the gain couldn't be changed. Then we replaced the lamp boad, and troubles resolved. So we made sure that the controlling chip in the lamp panel was damaged.

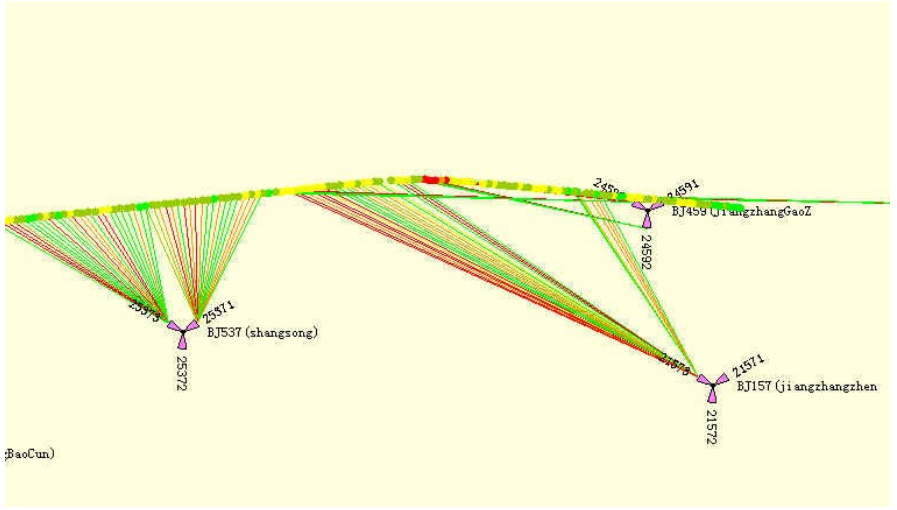
- **The state information of BMB can't be read through remote monitoring center:** After the BMB was installed in the BTS, the TMB status can be monitored by handheld terminal, but the remote monitor couldn't work. Then we replaced the modem, and the faulty was eliminated.

•Applications --- Operation Contrast

Railway Coverage Application

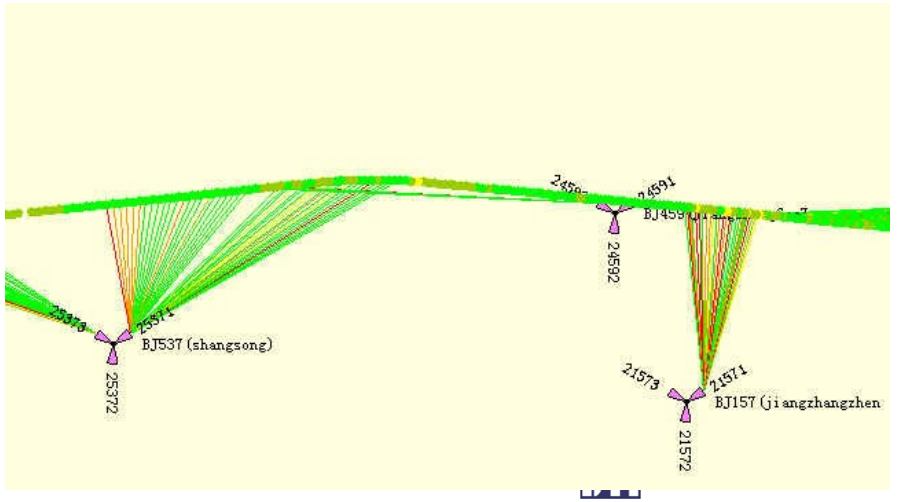
Road Test (RT) before installation of MCPA

Before MCPA was employed in the region of 25371, as the picture, the signal coverage along the railway is weak and small.



Road Test (RT) after installation of MCPA

After MCPA was installed in the region of 25371, as the picture, the coverage area along the railway has been widened, and the speech quality in this area has been improved a lot.



Questions !